

## Math 173 – Quiz #1

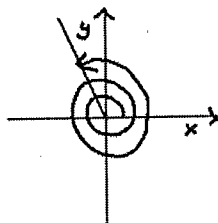
January 22, 2015

Name: Solution Set

Instructor: Patricia Wrean

Total: 40 points

1. Consider the following sketch of  $\theta$ , an angle in standard position whose reference angle is  $69^\circ$ . The swirly line indicates the number and direction of rotations. Calculate the size of the angle and list one negative coterminal angle. Also, state whether  $\sin \theta$  and  $\cos \theta$  are positive or negative. (4 points)



angle:  $831^\circ$

coterminal angle:  $-249^\circ$  (amongst many possibilities)

$\sin \theta$ : +

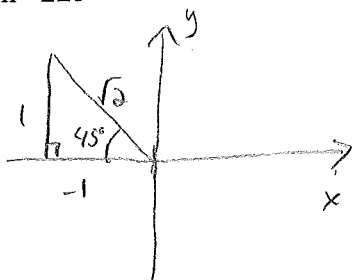
$\cos \theta$ : -

$$\begin{aligned} \theta &= 720^\circ + (180^\circ - 69^\circ) \\ &= 831^\circ \end{aligned}$$

2. Give the exact function value of the following. Show your work. (3 points)

$\sin -225^\circ$

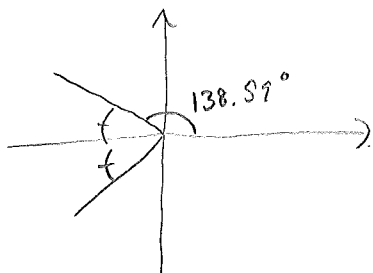
$\frac{\sqrt{2}}{2}$



$$\sin -225^\circ = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

3. If  $\cos \theta = -0.75$ , calculate  $\theta$ . ← no angle restrictions (4 points)

QII & QIII has  $\cos -$  (1)



$$\cos^{-1}(-0.75) = 138.6^\circ \quad (\text{in QII}) \quad (1)$$

so angle in QIII is  $-138.6^\circ$   
(or calculate ref angle to be  $41.4^\circ$ ) (1)  
and other angle is  $(180^\circ + 41.4^\circ) = 221.4^\circ$

So

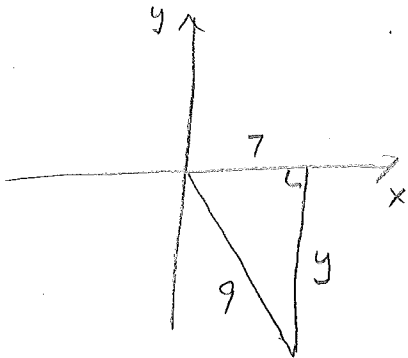
$$\theta = \begin{cases} 138.6^\circ \text{ or coterminal} \\ -138.6^\circ \text{ or coterminal} \end{cases} \quad (1)$$

Q I + IV

Q II + IV

4. Given that  $\cos \theta = \frac{7}{9}$ , and that  $\tan \theta$  is negative, calculate the other five trig functions of  $\theta$ . Give exact answers. (5 points)

so  $\theta$  is in Q IV



$$\begin{aligned} a^2 + b^2 &= c^2 \\ 7^2 + y^2 &= 9^2 \\ y^2 &= 32 \\ y &= \pm 4\sqrt{2} \\ &= -4\sqrt{2} \end{aligned}$$

$$\sin \theta = -\frac{4\sqrt{2}}{9}$$

$$\cos \theta = \frac{7}{9}$$

$$\tan \theta = -\frac{4\sqrt{2}}{7}$$

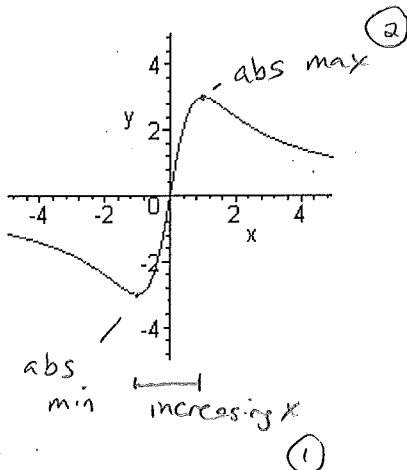
$$\csc \theta = -\frac{9}{4\sqrt{2}} = -\frac{9\sqrt{2}}{8}$$

$$\sec \theta = \frac{9}{7}$$

$$\cot \theta = -\frac{7}{4\sqrt{2}} = -\frac{7\sqrt{2}}{8}$$

(-1) not exact  
 (-2) wrong  $\Delta$   
 (-1) no - on y  
 (-3) each type of simplification error

5. Consider the function graphed below. Locate any maximum/minimum points on the graph and state whether they are absolute or relative. Also, indicate on the graph the intervals of  $x$  for which the function is increasing. Lastly, state the domain and range of this function, rounding to the nearest integer. (Just in case it's not clear, the function continues off the edge of the graph, getting closer and closer to the  $x$ -axis the further you go.) (5 points)

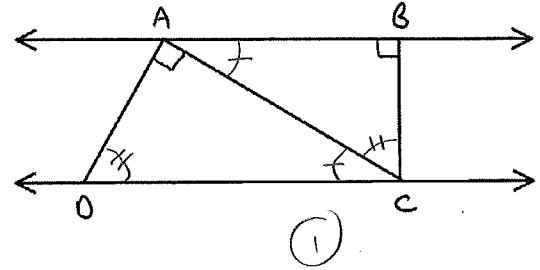
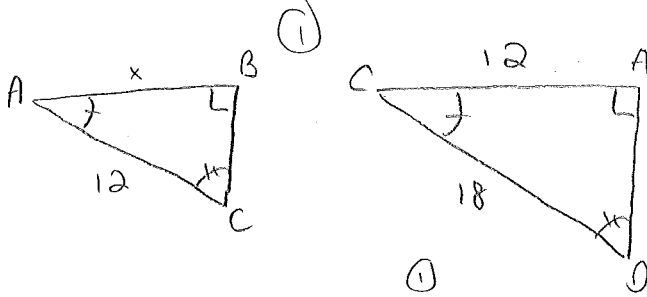


domain:  $\mathbb{R}$  (1)

range:  $[-3, 3]$  (1)

or  $\{y \mid -3 \leq y \leq 3\}$

6. In the diagram below, the line AB is parallel to CD. Given that AC = 12 and CD = 18, calculate the length AB. Show your work by labeling any congruent angles you are using on the diagram, stating which triangles are similar and why if you are using any similarity properties, and clearly labeling which sides you are using if setting up a ratio. (6 points)



$\triangle ABC \sim \triangle CAD$  by AAA (1)

$$\frac{AB}{AC} = \frac{AC}{CD} \quad (1)$$

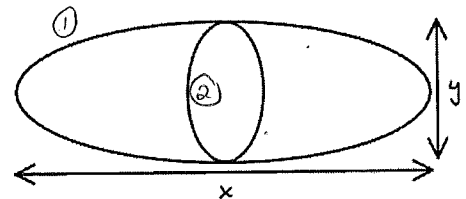
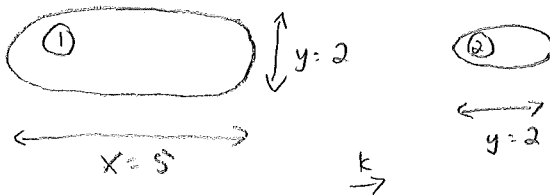
$$\frac{x}{12} = \frac{12}{18}$$

$$18x = 144$$

$$x = 8 \quad (1)$$

AB = 8

7. The logo for a new technology startup company is made of two similar ellipses (ovals). The logo is perfectly symmetrical, with  $x=5$  and  $y=2$  where  $x$  is the length of the logo and  $y$  is the height as shown in the diagram. If the area of the larger ellipse is 30 square units, calculate the area of the smaller ellipse. Show your work, giving an exact answer. (4 points)



$$k = \frac{y}{x} = \frac{2}{5} \quad (1)$$

(1)  $Area_2 = k^2 Area_1$

$$= \left(\frac{2}{5}\right)^2 \cdot 30 = \frac{4}{25} \cdot 30 = \frac{24}{5} \text{ or } 4.8$$

area<sub>2</sub> =  $\frac{24}{5}$  units<sup>2</sup> (2)

or 4.8 units<sup>2</sup>

(units optional)

8. State the domains of the functions  $f(x) = \frac{1}{x+9}$  and  $g(x) = \frac{1}{\sqrt{x+9}}$ . Also, calculate  $g(1)$ . (3 points)

domain of  $f(x)$ :

$$\{x \mid x \neq -9\}$$

$$(-\infty, -9) \cup (-9, \infty)$$

domain of  $g(x)$ :

denom cannot be zero, but  $\sqrt{x}$  is always  $\geq 0$ , so  
no issue, just deal with square root

$$\{x \mid x \geq 0\}$$

$$[0, \infty)$$

and  $g(1) = \frac{1}{\sqrt{1+9}} = \frac{1}{10}$

9. The clock tower on the Young Building at the Lansdowne campus is 7 m tall. On a field trip, a Civil Technology student standing a horizontal distance of 18 m from the side of the building measures the angle of elevation from the ground to the bottom of the clock tower to be  $38^\circ$ . From the student's perspective, what is the angle subtended by the clocktower (marked as angle  $x$  on your diagram)? You may assume that the sides of the building and clocktower are perfectly vertical. Round your answer to the nearest integer. (6 points)

$$\tan 38^\circ = \frac{h_1}{18}$$

$$h_1 = 18 \tan 38^\circ$$

$$= 14.0631$$

$$\tan(38^\circ + x) = \frac{h_2}{18} = \frac{h_1 + 7}{18} = \frac{21.0631}{18}$$

$$38^\circ + x = 49.4837^\circ$$

$$x = 11.9837^\circ$$

$$= 12^\circ$$

The angle subtended by  
the clocktower is  $12^\circ$ .

